PLUNGER PUMP SERVICE MANUAL

ARIMITSU PROVEN PLUNGER PUMPS

3 Series

INSTALLATION AND START-UP INFORMATION

Optimum performance of the pump is dependant upon the entire liquid system and will be obtained only with the proper selection, installation of plumbing for the pump and accessories.

SPECIFICATIONS: Maximum specifications refer to individual attributes and may have qualifications. It is not implied that any maximums can be performed concurrently. If more then one maximum is considered, check with your Arimitsu Pumps supplier of Arimitsu of N.A. to confirm the proper performance, environment, system design and pump selection. Refer to the respective Product Data Sheet (PDS) for complete specification, parts lists, performance charts and exploded view.

LUBRICATION: Fill crankcase with Arimitsu pump oil (p/n 30103) to required level. DO NOT RUN PUMP WITHOUT OIL IN CRANKCASE. Change oil according to the following schedule; after the first 30 hours, then every 500 hours or once per year which ever comes first. Additional lubrication may be required with increased hours of operation, temperature, and various environments.

PUMP ROTATION: Pump was designed for forward rotation, unless otherwise noted by a directional arrow. If rotating counter to arrow, additional oil should be added to aid lubrication. Fill to slightly above the upper line on dipstick to assure adequate lubrication.

PULLEY SELECTION: Select size of motor pulley required to deliver the desired flow. Be careful to choose a pulley with the proper horsepower capacity. Horsepower requirement can be found on PDS for each respective model. Use formula found on formulas page as a guide to pulley selection.

Note: Use the same pitch size pulleys for both pump and motor.

DRIVE SELECTION: The motor or engine driving the pump must be of sufficient horsepower to maintain full RPM when the pump is at the desired load. Select the electric motor from the Horsepower chart according to required pump discharge flow, maximum pressure at the pump and drive losses of approximately 5%. Consult the manufacturer of gas or diesel engine for selection of the proper engine size. Use formula found on formulas page as a guide for HP calculation.

The quotient will indicate the minimum HP size of motor to select. Please choose a HP size larger when possible to allow for system inefficiencies such as line loss and plumbing irregularities.

MOUNTING:
Choose a level horizontal surface that will allow access for maintenance and visual inspection. The surface must be able to withstand vibration and be strong enough to support the pump.
Use flexible hose for inlet and discharge connections on the pump to minimize possible system stresses. Never connect rigid pipe to the inlet of discharge of the pump.
Make sure the pump crankshaft and motor crankshaft are parallel and mounted pulleys are in the straight line. Misalignment will lead to a loss of performance and premature belt failure, in addition to damaging the pump and/or motor.

- Choose a properly-rated belt for the HP of the system. Tighten to the specifications recommended by the belt manufacturer. Do not over tighten. Hand rotate pump pulley prior to starting to verify shaft and bearings are free moving.
- Protect pump from humidity, dirt, heat, water spray and chemical exposure.

PLUMBING:
INLET: When done correctly, inlet plumbing will positively benefit the system. If you have any questions, please contact Arimitsu Pumps.

- DO NOT STARVE PUMP OR RUN DRY
- As a minimum requirement, use a hose one size larger than the inlet port size.
- The pump will work best with a pressurized inlet that does not exceed the maximum recommended on the specification sheet.
- Every pump is designed for suction lift (vacuum) inlet conditions, however optimum performance is obtained with a pressurized inlet. In cases such as hot or thick liquids, or high speed a positive inlet is recommended.
- Several long-term failures result from improperly plumbed inlet systems such as, valve breakage, manifold washout, seal failure, noise, vibration, and plunger pitting.
- Pumps are not designed to run dry.
- Temperatures above 120°F are permissible. Add 1 PSI inlet pressure per each degree F over 120°F. Elastomer or RPM changes may be required in addition to pressure adjustment.

DISCHARGE: The fluid must have a place to go. All pumps MUST have hydraulic flow control devices.

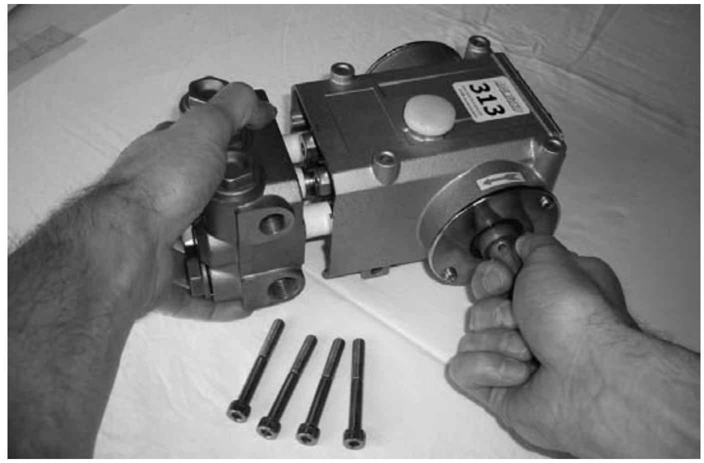
- Install a properly sized and functioning flow control device such as an unloader valve or pressure regulator that will allow pumped fluid to be diverted in case nozzles become plugged or trigger is disengaged.
- Do not use metering valves or ball valves as primary flow control devices.
- DO NOT use a regulating device with selectable pressure greater than pump rating.
- Open all valves prior to starting system to avoid deadhead overpressure condition and severe damage to the pump or system.
- Install a pulsation dampener, pulse hose or accumulator, on the discharge head or in the discharge line as close to the head as possible. Be certain the pulsation dampener is properly sized for the system pressure and flow.
- A reliable pressure gauge should be installed near the discharge outlet of the high-pressure manifold. This is extremely important for adjusting pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the pressure at the discharge manifold of the pump, not anywhere else in the pressure line.
- Use PTFE thread tape or pipe thread sealant to connect accessories or plumbing.

MAINTENANCE:
Check: Inspect all system accessories and connections prior to start-up.

- Oil quality and level. Add oil if it is low and change if the oil looks old or milky. (Arimitsu Oil p/n 30103)
- For leaks from manifold and crankcase. Change seals as necessary or according to scheduled service intervals.
- Clean inlet filter or strainer as needed.
- Verify nozzles are not worn or damages. Nozzles create the pressure, so a worn nozzle will result in lower performance. Worn or damaged hoses must be replaced before use.
- Verify unloaders/regulators are adjustable and appear in good condition.
- Inspect hoses and connections for damage.
- Inspect belts for signs of wear or damage.
- Inspect trigger guns and other control valves.

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SERVICING THE FLUID END

Seal Service follow steps 1-8, & 14

1. Remove center (4) manifold bolts (6mm).

2. Gently pull Manifold Assembly away from crankcase. Be careful to pull straight to avoid damaging plungers. Rotation of crankshaft may aid in separating the manifold from the crankcase.

3. Lay manifold on work surface. Remove seal retainer, V packing, spreader and wave washer with a gentle pull with index finger. Inspect seal bore for damage and clean if necessary.

4. Remove vacuum seal from the inside of seal retainer with a plastic driver to avoid scratching brass surface. Inspect for damage. Complete seal service with Seal Kit (PN30114).

5. Insert wave washer, spreader, V packing into seal chamber of manifold. Install new vacuum seal by squeezing and fitting into inside groove of seal retainer. Be sure to install vacuum seal with "u" (groove) of the seal facing towards V packing.

6. Replace seal retainer o-ring (included in PN30114) around outside of seal retainer.

7. Lightly grease seal bore and insert seal retainer. Even force will allow seal retainer to slide into position.

8. Lightly lubricate plungers and carefully slide Manifold Assembly over plungers until it contacts the crankcase assembly. Replace center 4 bolts and torque to 18 ft lbs.

   Note: Bolts should be tightened following the standard practice of an X pattern.









Valve Service follow steps 9-14

9. Valve service can be done with technician preference of manifold assembly on or removed from the crankcase. It is easier if manifold remains attached to pump.

10. Remove hex valve caps (24mm).

11. Remove valve assembly with needle nose pliers by grasping top of white valve cage. Remove valve seat o-ring from valve chamber inside manifold.

12. Examine valves for damage such as pitting, gouging, or broken parts. Check for foreign material, such as tape and plastic or metal objects, which may be lodged in the valve springs or between valve disc and valve seat. If damaged or worn, replace with Valve Kit (PN30108). (3 valves per kit)

13. Lubricate new valve seat o-ring and install into valve chamber in manifold. Install new valve assembly into valve chamber and press firmly onto valve seat o-ring. Install hex valve caps and torque to 40 ft lbs.

14. Crankshaft should turn with minimal effort by hand when seal and valve service is complete. Check/add crankcase oil to proper level on dipstick before operation. Arimitsu oil (PN30103).

TORQUE CHART

					Torque	
Pump	**Item**	**Thread**	**Tool Size (P/N)**	**in lbs**	**ft. lbs.**	**Nm**
3 Series	Valve Plug	22mm	24mm Hex	475	40	53.9
	Manifold Bolts	8mm	6mm Allen	215	18	24.5
	Connecting Rod	6mm	10mm Hex	95	8	10.8
	Plunger Retainer	5mm	4mm Allen	60	5	6.9
5 Series	Manifold Bolts	8mm	6mm Allen	215	18	24.5
	Connecting Rod	6mm	10mm Hex	95	8	10.8
	Plunger Retainer	5mm	4mm Allen	60	5	6.9
7 Series	Outer Manifold Bolts	8mm	6mm Allen	215	18	24.5
	Inner Manifold Bolts	10mm	8mm Allen	475	40	53.9
	Connecting Rod	6mm	10mm Hex	95	8	10.8
	Plunger Retainer	5mm	4mm Allen	60	5	6.9
11 Series	Manifold Nuts	12mm	19mm Hex	695	55	78.5
	Connecting Rod	8mm	13mm Hex	215	18	24.5
	Plunger Retainer	5mm	4mm Allen	60	5	6.9

INLET CONDITION CHECK-LIST

INLET PRESSURE should fall within the specifications of the pump.
- o Optimum pump performance is obtained with +15 PSI (1 BAR) inlet pressure.
- o With adequate inlet plumbing, most pumps will perform with flooded suction. Maximum inlet pressure is 75 PSI (5 BAR).
- o After prolonged storage, pump should be rotated by hand and purged of air to facilitate priming.
- o Disconnect the discharge port and allow liquid to pass through pump and measure flow.

INLET ACCESSORIES are offered to protect against over pressurization, contamination or temperature and control flow.
- o A shut-off valve is recommended to facilitate maintenance.
- o Inspect and clean inlet filters on a regular schedule to avoid flow restriction.
- o All accessories should be sized to avoid restricting the inlet flow.
- o All accessories should be compatible with the solution being pumped to prevent premature failure or malfunction.
- o A gauge between filter and pump will indicate pump inlet pressure. Avoid negative pressure (vacuum) inlet conditions.

BY-PASS TO INLET Care should be exercised when deciding the method of by-pass from control valves.
- o It is recommended the bypass be directed to a baffled reservoir tank, as described above.
- o Although not recommended, bypass liquid may be returned to the inlet line of the pump. With a pressurized inlet system only, a thermo relief valve should be used in the by-pass line to monitor the temperature build-up in the by-pass loop to avoid premature seal failure.
- o A reinforced flexible, low-pressure hose rated up to 300 PSI should be used for bypass flow back to inlet.
- o Caution should be exercised not to under size the bypass hose diameter and length.
- o Check the pressure in the bypass line to avoid over pressurizing the inlet.
- o The by-pass should be connected to the pump inlet line with a constant downward slope.

INLET SUPPLY should exceed the maximum flow being delivered by the pump to assure proper performance.
- o Open inlet shut-off valve and turn on water supply to avoid starving pump. **DO NOT RUN PUMP DRY**.
- o Temperatures above 120°F are permissible. Add 1 PSI inlet pressure per each degree F over 120°F. Seal material or RPM changes may be required.
- o Avoid closed loop systems especially with high temperature fluid or large flows. The type of unloader or regulator can vary the effects of closed loop bypass.
- o Higher viscosity, thicker liquids require a positive head (0+ PSI) and RPM changes may be required. Horsepower requirements may increase.
- o When using a supply tank, size it to provide an adequate supply of water and enough volume to decrease turbulence created from bypass return stream. Generally, a minimum of 5 times the GPM although several system factors can affect this. Provide adequate baffling in the tank to eliminate air bubbles and turbulence; install diffusers on all return lines to the tank. Do not locate supply ports next to bypass return ports.
- o Supply tanks should be located above pump inlet with inlet lines plumbed from the bottom of the tank.
- o Tank fed, suction systems should have a constant downward slope into pump inlet.
- o Make sure adequate filtration exists to prevent debris from damaging pump.

INLET SIZE should be adequate to avoid starving the pump.
- o Line size must be a minimum of one common size larger than the pump inlet fitting. Avoid tees, 90-degree elbows or valves in the inlet line of the pump to reduce the risk of flow restriction and cavitation.
- o The line must be a FLEXIBLE reinforced hose, NOT a rigid pipe. Soft hose can decrease system vibration.
- o All systems should use a minimum of fittings and turns.
- o Use an approved pipe sealant or tape to assure airtight, positive sealing of all connections.

MAINTENANCE AND SERVICE TIPS

PREVENTATIVE MAINTENANCE CHECK-LIST

Check	Daily	Weekly	50 hrs.	500 hrs.*	1500 hrs.**	3000 hrs.**
Clean Filters	X					
Oil Level/Quality	X					
Oil Leaks	X					
Water Leaks	X					
Belts/Pulley		X				
Plumbing		X				
Initial Oil Change			X			
Oil Change				X		
Seal Change					X	
Valve Change						X
Accessories					X	

* If other than Arimitsu oil is used, change cycle would be every 300 hours

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 until wear is observed. Valves typically require changing every other seal change. Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear part and service cycle.

** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation.

SERVICE INTERVALS:
- Change Oil (PN30103) every 500 hours.
- Change high-pressure and low-pressure seals every 1500 hours.
- Change valves every 3000 hours.

SERVICE TIPS:
- When pumping harsh chemicals, flush out chemical residue immediately after use. Do not leave chemicals inside pump. If it is not water or anti-freeze, flush from pump before storage.
- If the pump is used in areas or times of freezing, pump it dry or leave anti-freeze in at time of storage.
- Use case and maintenance to prolong the life of the equipment.

ARIMITSU PUMPS QUALITY

HELPFUL FORMULAS AND REFERENCE CHARTS

Determining Pump RPM

$$\frac{\text{Rated GPM}}{\text{Rated RPM}} = \frac{\text{"Desired" GPM}}{\text{"Desired" RPM}}$$

Determining Required HP

$$\frac{\text{GPM x PSI}}{1460} = \text{Electric Brake H.P. Required}$$

Determining Motor Pulley Size

$$\frac{\text{Motor Pulley OD}}{\text{Pump RPM}} = \frac{\text{Pump Pulley OD}}{\text{Motor RPM}}$$

RESISTANCE OF VALVES AND FITTINGS

Nominal Pipe Size Inches	Inside Diameter Inches	Equivalent Length of Standard Pipe in Feet							
		Gate Valve	Globe Valve	Angle Valve	45° Elbow	90° Elbow	180° Close Ret	Tee Thru Run	Tee Thru Branch
1/2	**0.622**	0.41	18.5	9.3	0.78	1.67	3.71	0.93	3.33
3/4	**0.824**	0.54	24.5	12.3	1.03	2.21	4.90	1.23	4.41
1	**1.049**	0.69	31.2	15.6	1.31	2.81	6.25	1.56	5.62
1-1/4	**1.380**	0.90	41.0	20.5	1.73	3.70	8.22	2.06	7.40
1-1/2	**1.610**	1.05	48.0	24.0	2.15	4.31	9.59	2.4	8.63
2	**2.067**	1.35	61.5	30.8	2.59	5.55	12.30	3.08	11.6
2-1/2	**2.469**	1.62	73.5	36.8	3.09	6.61	14.70	3.68	13.20
3	**3.068**	2.01	91.5	45.8	3.84	8.23	18.20	4.57	16.40
4	**4.026**	2.64	120.0	60.0	5.03	10.80	23.90	6.00	21.6

Arriving at a total line pressure loss, consideration should then be given to pressure loss created by valves, fitting and elevation of lines.

If a sufficient number of valve and fitting are incorporated in the system to materially affect the total line loss, add to the total line length, the equivalent length of line of each valve or fitting.

NOZZLE VOLUME (GPM) AT VARIOUS PRESSURES (PSI)

Nozzle Size	Orifice Dia.	100 PSI	500 PSI	800 PSI	1000 PSI	1200 PSI	1500 PSI	2000 PSI	4000 PSI
2	.034	.32	.71	.89	1.00	1.10	1.22	1.41	2.00
2.5	.039	.40	.88	1.12	1.25	1.37	1.53	1.77	2.50
3	.043	.47	1.06	1.34	1.50	1.67	1.84	2.12	3.00
3.5	.048	.55	1.24	1.57	1.75	1.92	2.14	2.47	3.50
4	.052	.63	1.41	1.79	2.00	2.19	2.45	2.83	4.00
4.5	.055	.71	1.59	2.01	2.25	2.46	2.76	3.18	4.50
5	.057	.79	1.77	2.24	2.50	2.74	3.06	3.54	5.00
5.5	0.60	.87	1.94	2.46	2.75	3.01	3.37	3.89	5.50
6	.062	.95	2.12	2.68	3.00	3.29	3.67	4.24	6.00
6.5	.064	1.03	2.30	2.91	3.25	3.56	3.98	4.60	6.50
7	.067	1.11	2.47	3.13	3.50	3.83	4.29	4.95	7.00
7.5	.070	1.19	2.65	3.35	3.75	4.11	4.59	5.30	7.50
8	.072	1.26	2.83	3.58	4.00	4.38	4.90	5.66	8.00
8.5	0.74	1.34	3.01	3.80	4.25	4.66	5.21	6.01	8.50
9	.076	1.42	3.18	4.02	4.50	4.93	5.51	6.36	9.00
9.5	0.78	1.50	3.36	4.25	4.75	5.20	5.82	6.72	9.50
10	0.80	1.58	3.54	4.47	5.00	5.48	3.12	7.07	10.00
11	0.83	1.74	3.89	4.92	5.50	6.02	6.74	7.78	11.00
12	0.87	1.90	4.24	5.37	6.00	6.57	7.35	8.49	12.00
12.5	.089	1.98	4.42	5.59	6.25	6.85	7.65	8.84	12.5
13	.091	2.06	4.60	5.81	6.50	7.12	7.96	9.19	13.00
14	.093	2.21	4.95	6.26	7.00	7.67	8.57	9.90	14.00
15	.096	2.37	5.30	6.71	7.50	8.22	9.19	10.61	15.00
20	.109	3.16	7.07	8.94	10.00	10.95	12.25	14.14	20.00
25	.125	3.95	8.84	11.18	12.50	13.69	15.31	17.68	25.00
30	.141	4.74	10.61	13.42	15.00	16.43	18.37	21.12	30.00
40	.156	6.32	14.14	17.89	20.00	21.91	24.49	28.28	40.00
50	.172	7.91	17.68	22.36	25.00	27.39	30.62	35.36	50.00
60	.188	9.49	21.21	28.83	30.00	32.86	36.74	42.43	60.00

HOSE FRICTION LOSS

Water Flow GPM	PRESSURE DROP IN PSI PER 100 FT OF HOSE WITH TYPICAL WATER FLOW RATES Hose inside diameters, inches						
	1/4	**5/16**	**3/8**	**1/2**	**5/8**	**3/4**	**1"**
0.5	16	5	2				
1	54	20	7	2			
2	180	60	25	6	2		
3	380	120	50	13	4	2	
4		220	90	24	7	3	
5		320	130	34	10	4	
6			220	52	16	7	1
8			300	80	25	10	2
10			450	120	38	14	3
15			900	250	80	30	7
20			1600	400	121	50	12
25				650	200	76	19
30					250	96	24
40					410	162	42
50					600	235	62
60						370	93

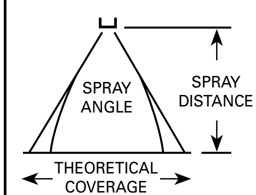
NOZZLE FORMULAS

$$\text{Nozzle\#} = \text{GPM} \times \sqrt{\frac{4000}{\text{PSI}}}$$

$$\text{GPM} = \text{Nozzle \#} \times \sqrt{\frac{\text{PSI}}{4000}}$$

$$\text{PSI} = \left(\frac{\text{GPM}}{\text{Nozzle}}\right)^2 \times 4000$$

SPRAY ANGLE



NOZZLE COVERAGE CHART

Included Spray Angle	THEORETICAL COVERAGE AT VARIOUS DISTANCES FROM NOZZLE ORIFICE								
	2"	4"	6"	8"	10"	12"	15"	18"	24"
5°	0.2	0.4	0.5	0.7	0.9	1.1	1.3	1.6	2.1
10°	0.4	0.7	1.1	1.4	1.8	2.1	2.6	3.1	4.2
15°	0.5	1.1	1.6	2.1	2.6	3.2	3.9	4.7	6.3
20°	0.7	1.4	2.1	2.8	3.5	4.2	5.3	6.4	8.5
25°	0.9	1.8	2.7	3.5	4.4	5.3	6.6	8.0	10.6
30°	1.1	2.1	3.2	4.3	6.4	5.4	8.1	9.7	12.8
35°	1.3	2.5	3.8	5.0	6.3	7.6	9.5	11.3	15.5
40°	1.5	2.9	4.4	5.8	7.3	8.7	10.9	13.1	17.5
45°	1.7	3.3	5.0	6.6	8.3	9.9	12.4	14.9	19.9
50°	1.9	3.7	5.6	7.5	9.3	11.2	14.0	16.8	22.4
55°	2.1	4.2	6.3	8.3	10.3	12.5	15.6	18.7	25.0
60°	2.3	4.6	6.9	9.2	11.5	13.8	17.3	20.6	27.7
65°	2.5	5.1	7.6	10.2	12.7	15.3	19.2	22.9	30.5
70°	2.8	5.6	8.4	11.2	14.0	16.8	21.0	25.2	33.6
75°	3.1	6.1	9.2	12.3	15.3	18.4	23.0	27.6	36.8
80°	3.4	6.7	10.1	13.4	16.8	20.2	25.2	30.3	40.3
85°	3.7	7.3	11.0	14.7	18.3	22.0	27.5	33.0	44.0
90°	4.0	8.0	12.0	16.0	20.0	24.0	30.0	36.0	48.0
95°	4.4	8.7	13.1	17.5	21.8	26.2	32.8	39.3	52.4
100°	4.8	9.5	14.3	19.1	23.8	28.6	35.8	43.0	57.2
110°	5.7	11.4	17.1	22.8	28.5	34.3	42.8	51.4	68.5
120°	6.9	13.9	20.8	27.7	34.6	41.6	52.0	62.4	83.2
130°	8.6	17.2	25.7	34.3	42.9	51.5	64.4	77.3	103
140°	10.9	21.9	32.9	43.8	54.8	65.7	82.2	98.6	
150°	14.9	29.8	44.7	59.6	74.5	89.5	112		
160°	22.7	45.4	68.0	90.6	113				
170°	45.8	91.6							

DIAGNOSIS AND MAINTENANCE

Several elements make up a complete, functioning pumping system. All of these elements need to be operating correctly in order for the whole system to function. Some of the elements include: duty-cycle, liquid being pumped, operating conditions and specifications versus the ratings and capabilities of the pump and accessories. Proper care and maintenance of pump and system components will maximize the life of your equipment. Review and follow recommendations regarding system design and inlet conditions to avoid potential problems.

Arimitsu Pumps are designed to offer superior life and be easy to service. Field servicing can be accomplished with standard tools. Use the following table as a guide to determine cause and remedy for possible problems. Contact Arimitsu Pumps directly via web site or telephone for further assistance.

PROBLEM	PROBABLE CAUSE	SOLUTION
Low pressure	• Worn nozzle. • Belt slippage. • Air leak in inlet plumbing. • Pressure gauge inoperative or not registering accurately. • Relief valve stuck, partially plugged or improperly adjusted. • Inlet suction strainer (filter) clogged or improperly sized. • Abrasives in pumped liquid. • Leaky discharge hose or spray gun. • Inadequate liquid supply. • Severe cavitation. • Worn Seals. • Worn or dirty inlet/discharge valves.	• Replace with properly sized nozzle. • Tighten belt(s) or install new belt(s). • Tighten fittings and hoses. Use PTFE liquid or tape. • Check with new gauge. Replace worn or damaged gauge. • Clean/adjust relief valve. Replace worn seats/valves and o-rings. • Clean filter. Use adequate size filter. Check more frequently. • Install proper filter. • Replace discharge hose with proper rating for system. • Check & clean filters. • Check inlet conditions. • Install new seal kit. Increase frequency of service. • Clean inlet/discharge valves or install new valve kit.
Pulsation	• Faulty Pulsation Dampener. • Foreign material trapped in inlet/discharge valves.	• Check precharge. If low, recharge, or install new dampener or pulse hose. • Clean inlet/discharge valves or install new valve kit.
Water leak •Under the manifold •Into the crankcase	 • Worn V-Packings, Hi-Pressure or Lo-Pressure Seals. • Humid air condensing into water inside the crankcase. • Excessive wear to seals and V-Packings.	 • Install new seal kit. Increase frequency of service. • Change oil every 3 months or 500 hours. • Install new seal kit. Increase frequency of service. Check inlet & water conditions
Knocking noise •Inlet supply •Pulley	 • Inadequate inlet liquid supply. • Loose pulley on crankshaft	 • Check liquid supply. Increase line size, pressurize, or dual feed. • Check key and tighten set screw.
	Recommended Oil Service Intervals: After first 30 hours, every 500 hours thereafter.	
Oil leak •Crankcase oil seals •Crankshaft oil seals and o-rings •Drain plug •Rear cover •Filler cap	 • Worn crankcase oil seals. • Worn crankshaft oil seals or o-rings on bearing cover. • Loose drain plug or worn drain plug o-ring. • Loose rear cover or worn rear cover gasket. • Excessive oil in crankcase.	 • Replace crankcase oil seals. • Remove bearing cover and replace o-rings and/or oil seals. • Tighten drain plug or replace o-ring. • Tighten rear cover or replace gasket. • Fill crankcase to specified capacity, do not overfill.
Pump runs extremely rough •Inlet conditions •Pump valves •Pump seals	 • Restricted inlet or air entering the inlet plumbing. • Stuck inlet/discharge valves. • Leaking V-Packings, Hi-Pressure or Lo-Pressure seals.	 • Correct inlet size plumbing. Check for loose connections. Clean filters. • Clean out foreign material or install new valve kit. • Install new seal kit. Increase frequency of service.
Premature seal failure	• Scored plungers. • Over pressure to inlet manifold. • Abrasive material in the liquid being pumped. • Excessive pressure and/or temperature of pumped liquid. • Running pump dry. • Starving pump of adequate liquid.	• Replace plungers, check inlet conditions. • Reduce inlet pressure per specifications. • Install proper filtration at pump inlet and clean regularly. • Check pressure and inlet liquid temperature. • DO NOT RUN PUMP WITHOUT LIQUID. • Increase hose one size larger than inlet port size. Pressurize and dual feed.

ARIMITSU PUMPS QUALITY